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ABSTRACT

This paper explores the challenges that South Mountain Community College (Phoenix, Arizona) faced in order to take advantage of the opportunities computer technology offered in its teacher education program. Three issues are examined which were critical to the effective use of computer technology: (1) the technology itself, including the college's emphasis on open-ended computer tools and the benefits of this technology for students; (2) the classroom learning environment in which the technology was used, i.e., the Dynamic Learning teacher preparation program, a classroom learning environment that invites students to mindfully engage in their studies, particularly when using computer technology; and (3) the administrative changes and challenges needed to facilitate instructional innovations, including budgeting, network infrastructure requirements, administration of the Dynamic Learning computer laboratory, training, off-campus access to technology, and course scheduling. The paper emphasizes how these factors led faculty and administrators to a dialectical process of discussion and action across campus to meet the needs of students. (AEF)

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# Interaction of Technology Based Classroom Innovations and Administrative Systems

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Introducing computer technology into teacher education programs offers a host of teaching and learning opportunities. Educators argue that computer technology promises everything from enhancing the delivery of instruction, to improving students' learning, to spurring the development of novel models of teaching and learning (Cole, 1990). At South Mountain Community College we sought to reap some of these technological advantages by building a computer laboratory specifically devoted to our Dynamic Learning teacher preparation program. We soon realized, however, that technology did not automatically bring about enhanced learning and educational reform. Instead, the introduction of technology created many challenges for our students, faculty, and administrators. In this paper we explore the challenges our campus faced in order to take advantage of the opportunities computer technology offered us. We examine three issues we believe were critical to our effective use of computer technology: the technology itself, the classroom learning environment in which we use technology, and the administrative changes needed to facilitate our instructional innovations. We emphasize how these factors led faculty and administrators to a dialectical process of discussion and action across campus to meet the needs of our students.

## Classroom Technology

The first question raised by the introduction of technology into the classroom concerns the technology itself: "What technology should we use?" The options are vast, ranging from skill specific drill and practice software, through expert-like intelligent tutoring systems, to open-ended tools like word-processors and spreadsheets, Internet exploration, and simulation "games" like Myst and SimCity. The evidence of the effectiveness of the drill and practice programs and the "expert" guidance systems which provide learners much information and usurp most of the thinking is less than encouraging. Often this sort of computer application has minimal, transferable impact on students' learning (Spiro, Feltovich, Jacobson, & Coulson, 1991). It made more sense to introduce our group of prospective teachers to applications which might enhance what they will do as classroom teachers. Therefore, our campus decided to emphasize open-ended computer tools and applications which require learner thought and activity.

Our reliance on open-ended computer tools focused our classroom technology plan on two outcomes we hoped to accrue: effects with technology and effects of technology (Salomon, Perkins, & Globerson, 1991). Effects with computers occur when learner cognitive, affective, or behavioral performance is enhanced during computer usage. For example, if students write more polished essays than they otherwise would while using a word processor that offers grammar and spell checking, they experience an effect with technology. Effects of computers accrue when students grow as a consequence of working with computers. For example, students who compose better essays with only pen and paper after using software which provides composition guidance show an effect of computers. Both effects are prized learning outcomes for our prospective teachers.

Cultivating these two technological outcomes has tremendous benefit for our students. When experiencing effects with computers learners actually form an intellectual partnership with the technology in which students' performances exceed what they do without the technology. When the partnership is well-suited to learning, computers assume repetitive, time-consuming, lower-order tasks, allowing students to focus on more complex, higher-order thinking. For example, many word processing programs allow students to devote time and energy to language choices, organization, argument structures, and theme development by expediting spell checking, formatting, and writing mechanics. The partnership allows students to attempt higher-order, more meaningful tasks that would be difficult to attempt away from the computer. Further, to the extent that students have practiced these new skills, at some point they may be able to employ their new acquisitions absent the technology. Through the use of open-ended computer



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tools, technology offers learners the opportunity to develop cognitive and behavioral skills that would be considerably more difficult to develop absent the technology.

While these computer applications offer important learning opportunities for our students, they do not accrue automatically. The value offered by open-ended computer tools presents a bit of a paradox. Most computer applications, especially those suitable for general teacher preparation, teach very little in and of themselves. Rather, it is the thinking in which students engage when using computers that results in learning (Salomon, 1992). Students won't cultivate the higher-order thinking skills computer applications offer, unless they expend the cognitive effort necessary to focus on them. For example, using a word processor helps students format, spell check, and generally polish their essays, but it does not teach writing skills. However, if students focus on higher-order structures of writing such as theme development, structural organization, argument analysis, voice, and language choices, word processing can help them develop excellent writing skills. Spell checking and formatting are great. But, the learning advantage of word processing comes when students use computers to free themselves from these relatively mundane, tedious, and time-consuming aspects of composition to focus on more challenging aspects like structure, theme development, and issue analysis. Clearly, it is the manner in which students use computer tools which fosters learning. Students must be mindfully engaged to benefit from computer tools (Salomon, Globerson, & Guterman, 1990).

In turn, it is the learning context in which students use computers which influences the quality of their thinking. When students find an activity unexciting or without real consequences, they are unlikely to expend the cognitive effort necessary to cultivate higher-order thinking skills. Thus, the challenge we faced in the Dynamic Learning program was to design a classroom environment in which students were willing to mindfully engage in their learning tasks and take full advantage of the learning opportunities the computer offered them. The key is that the learning environment must lead students to look beyond the surface features of computing and focus on the opportunities for thinking and learning that technology offers. It is the use of technology in the appropriate learning environment which accounts for student learning more so than does the application of technology or novel learning environments alone (Salomon, 1992).

## Classroom Learning Environment

The Dynamic Learning Program at South Mountain Community College is our attempt to build a classroom learning environment that invites students to mindfully engage in their studies, particularly when using computer technology. Dynamic Learning offers the first two years of a university articulated professional teacher preparation program. A new cohort of students enters the program each year, completing their four semester sequence together as a learning community. The cornerstone of each semester is an integrated block of general studies and education courses taught from a single syllabus. Each block meets about three hours a day for three days each week, and is taught by a team of three faculty members. Due to laboratory course requirements, at least one course each semester is taught outside of the block format. Students also participate in a field experience each semester in local elementary, middle, and high schools, working closely with students, teachers, and administrators from these institutions. This program design allows Dynamic Learning students to study in an environment that is authentic, collaborative, interdisciplinary, and inquiry-based.

Dynamic Learning features authentic learning activities which have impact on students beyond their academic merits. For example, instead of giving public speeches only in the classroom, students earn course credit by speaking in venues outside of class. In particular, students have numerous speaking opportunities in their field experience, working with faculty, administrators, and students at those institutions. Since students choose these speaking engagements themselves, they have personal significance and the event has meaning beyond its course credit. The presentation graphics, outlining, and organizing students do at the computer has significant value to them because they are judged, not only according to classroom standards, but by professional standards by the students and staff at their placement schools as they present lessons, in-service sessions to teachers, and policy proposals to administrators.

The environment is collaborative in many ways. Students work in cooperative teams. They work with students and faculty from the university, high school, and elementary levels. They also work with members of the community on a regular basis as part of their studies. Technology facilitates this collaboration. Since our "classroom" now extends beyond its traditional walls into local schools, universities, government agencies, businesses, and neighborhood charitable organizations, computer-mediated communication is necessary to bring our students in contact with these parties. The planning, organization, writing, and interpersonal skills necessary to such collaboration become the real benefits of computer-mediated communication and the other applications students use in these ventures.

The program is also interdisciplinary in that courses are taught in "blocks" by teams of instructors. Instead of enrolling in a series of separate courses, students meet in a single three to four hour block each school day (9 - 12 credit hours a semester) in which they study several discipline areas simultaneously. Among other benefits, our interdisciplinary focus means we save time by not repeating basic information in different courses (e. g., outlining skills in composition and public speaking courses). As a result, students have time to delve deeper into their course

projects. This focus also encourages students to view educational issues with an integrative perspective. Thus, we spend less time on the basic issues of computer usage, less on the surface applications of technology to an issue (e. g., less on polishing an outline or essay), and more on the deeper applications of technology to real problems (e. g., what sequence of evidence and arguments might be most persuasive to a school board on a certain issue).

This is facilitated through inquiry-based studies in which students explore a theme, issue, or question with the tools of several disciplines concurrently. For example, a typical assignment for freshman Dynamic Learning students is to become agents of change on an educational issue of significance within the community. While students' projects have various levels of effectiveness, they all employ substantial writing, speaking, and critical thinking skills. In this context, technology becomes an important tool students need to accomplish personally relevant and meaningful goals. Students place a premium on computer time for crafting essays, writing letters, managing deadlines, brainstorming, creating charts and graphs, making presentation outlines and slides, organizing ideas, constructing models, conducting library and Internet searches, exchanging Email, testing ideas, analyzing survey data, and creating and using art, videos, and music. Because students complete these activities to accomplish their own purposes, they do so of their own volition, with attention to detail, and with concern for their results. They are mindfully engaged.

Our implementation of these four principles make the Dynamic Learning environment substantially different than the traditional college classroom. But, it is our application of computer technology within this innovative classroom learning environment which works to enhance students' learning. Computer technology affords students the opportunity to focus on higher-order thinking skills by assuming lower-order, repetitive, and mundane chores. The novel Dynamic Learning classroom environment entices students to take advantage of these opportunities technology affords by making their studies personally relevant and meaningful so that they mindfully engage in their work. Thus, heavy reliance on technology in an innovative learning environment has a reciprocal effect: Technology helps create an innovative classroom environment by bringing the community, ideas, disciplines, and people into the classroom. At the same time, our innovative environment makes technology educationally useful by encouraging students to become mindfully engaged in their studies with computers. The result for our students is enhancements in learning that are difficult or impossible without technology applied in an appropriate learning environment.

## Administrative Changes

The changes we undertook in the Dynamic Learning classroom to support our technology-intensive focus happened neither automatically nor absent challenge. Rather, they posed numerous administrative hurdles for our campus to overcome. With the reliance upon the use of computer technology in the program, there were new capital budget demands and network infrastructure requirements that were negotiated and resolved. Questions of ownership, maintenance, and scheduling for the Dynamic Learning in-class laboratory of 25 computers surfaced. Since all block faculty were not equally skilled with computers, faculty training and support became an issue. Similarly, faculty office computers had to be upgraded and made consistent with lab computers for continuity. Training was needed for students as well as faculty, so that faculty could devote class time to teaching in their areas of expertise, rather than serve as computer tutors. The "real world" focus of the block encouraged students to make real use of technology, in turn, raising issues of student web page and server use policy. Provisions had to be made to bring Dynamic Learning off campus partners access to our technology and integrate our capabilities with theirs. And, our primarily faculty and staff focused Educational Technology Center now had to play a significant role in the classroom usage of technology. Each of these issues had to be addressed in order to support the technological innovations we introduced into the classroom. If any one of these had been ignored, the success of our project would have been greatly curtailed.

The development of learning environment we needed to maximize the educational effectiveness of our technology also posed several administrative puzzles. To start, the collaborative, interdisciplinary format required coordination and adjustments in the student advising process with needs for new advisor training sessions. In addition, this block format necessitated changes in the overall student registration process as students no longer registered for discrete courses but rather for packages of courses. Faculty at South Mountain Community College are contracted to teach a set number of course loads and have an established number of hours of accountability on campus each semester. The established course loading formulas and hours of accountability needed to be modified in order to support the block design of the curriculum developed by the three lead faculty. Broad course schedule coordination also became an administrative project with the need to offer the out of block courses at times which would meet the needs the student cohort. As a result, the program impacted a number of divisions and departments at the college requiring that new allegiances be formed. Faculty and administrators needed to work as a productive team to establish articulation agreements so that students completing the block program at South Mountain Community College could easily enroll in the upper division teacher education program at the local university. All of these challenges were brought about by innovations needed to maximize the instructional effectiveness our technology intensive program. Again, each of

these issues had to be addressed in order for the classroom innovations to succeed.

The Dynamic Learning Program at South Mountain Community College has resulted in a number of instructional innovations which have enhanced student performance, confidence, and persistence. Computer technology has been an important key stone to a number of collaborative and interdisciplinary approaches within this block program. Concurrent with these instructional innovations, a number of administrative processes and procedures had to be modified or developed in order to provide the needed support and structure for this program. Student performance and satisfaction demonstrates the Dynamic Learning program to be instructionally sound and effective. As a result of the success of the program, there has been concomitant campus impact in a number of arenas including policy, budget allocation, student services, schedule development, division to division cooperation, and articulation with other educational systems.

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